AMERICAN PRINTING HOUSE
FOR THE BLIND, INC.

Department of Educational and Technical Research

Report of Research and Development Activities

Fiscal 1996

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Mission

The American Printing House for the Blind promotes independence of blind and visually impaired persons by providing special media, tools, and materials needed for education and life.

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The research and development program at the American Printing House for the Blind (APH) has continued to make remarkable headway, despite reduced resources--both financial and personnel. This reflects positively on staff and appropriate guidance by APH's advisory committee for research and development composed of:

Sister Louis Marie Baxter, Lavelle School for the Blind
Dr. Bernadette M. Kappen, Overbrook School for the Blind
Mr. William R. Mann (chairman), Nebraska School for the Visually Handicapped
Mr. Vernon Metcalf, Florida Association of Workers for the Blind, Inc.
Mrs. Martha R. Murrell, Texas Education Agency
Dr. Dean O. Stenehjem, Washington State School for the Blind
Mr. Chris Tompkins, The Foundation for Blind Children

Project areas being addressed by educational research personnel during APH's 1996 fiscal year have been early childhood, multihandicapped, low vision, braille, educational measures, mathematics, microcomputer applications, science, tactile graphics, and transition, as well as an indepth study of the 1995 quota registration population; while technical research staff has forged ahead in the electronics areas as well as being responsible for the "preproduction" work required for all new nonbook products. These activities are briefly summarized in this report. The technical research staff has been under the expert guidance of Mr. Bob Phelps while the educational research staff was led by Dr. William Lohss until his resignation in May 1996. All research personnel have striven to work smarter and more efficiently in this time of reduced resources and ever greater needs for unique, specialized materials.

Formal research activities were initiated at APH in 1952 as a direct result of a request by the Research Committee of the American Association of Instructors of the Blind. This Committee recommended APH, "do educational research, including not only that which is pertinent to production at the American Printing House, but to include research on any educational problem of sufficient importance among the schools to require study and clarification." This function dovetails neatly with APH's charter which states as part of the nature of the business that APH do, "research of all kinds for the benefit of blind persons."

In recent years, most research undertaken by APH has been in the development of new products specifically designed to meet the unique needs of persons who are blind or seriously visually impaired. If commercially available materials are not available that meet these unique needs, or can be easily adapted to do so by those serving them, then these materials are eligible to be purchased with the federal funds (quota) made available through

the 1879 Act To Promote the Education of the Blind and administered by APH. As a portion of these funds are used to develop special and unique products of an educational nature, most of APH's R & D efforts have been focused on educational materials that will be eligible for purchase with quota funds.

The typical development cycle of a new product is described as follows. First, is the identification of the need for a material. These ideas come from many sources such as consumer requests and surveys, research findings, curriculum analyses, consumer panels, the U.S. Department of Education, etc. Next comes the important task of determining priorities for what is always a multitude of needs. Here, both market research to help determine what areas of work would help meet the needs of the greatest number of students and input from APH's advisory committees help determine the areas of work. The next step is to bring in expert consultants within each area to help identify specific deficits within the area. Following this, a search is made for commercial materials that might meet the need. If found, APH will not invest its R & D resources. Once work is initiated in a specific area, groups of consultants from the field help develop specifications for unique products that will address identified needs. From these initial specifications working models are developed. These are reviewed by project consultants and subsequently modified accordingly. Prototypes are then developed which are sent into the field for evaluation while in use with the type of population for which they are being designed. At any point where major changes are involved, the step may be repeated. Data from the final field evaluation are used to refine the product and prepare it for "preproduction," which is one of the functions of the technical research group.

APH's Technical Research Department has two primary functions; first, to prepare and introduce new products to APH's production process and, second, to adapt or develop equipment and tools involving electronics and/or technology. Steps involved in "preproduction" work include finalizing product design, preparing technical drawings, designing prototypes for electronics, generating computer files for cutting patterns for molding-artwork-silkscreening, making or having made patterns and molds, identifying outside vendors, sourcing new raw materials and providing information for purchase orders, determining how the product is to be sold and designing packaging accordingly, obtaining parts numbers and catalog numbers, developing a preliminary bill of materials, and preparing detailed documentation for production of the product. And, when appropriate, having it tested for safety (e.g., UL, FCC, or other independent agency for product safety).

From Technical Research the product goes to production where the bill of materials is finalized, a production routing developed, and a production schedule determined. Once produced the product is priced, shelved, and advertised.

Early Childhood

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Infant Skills Project (on hold)

Purpose: To develop materials targeted for infants and toddlers, birth-24 months; to develop accompanying written material useful to parents and teachers in developing critical skills in young children

Project staff: Sheri Moore, Project Director
Debbie Johnson, Project Assistant
Beth Langley, Project Consultant

Background. The most recent Early Childhood Materials Needs Assessment meeting delineated and set priorities in several areas. The Infant Skills project received a high priority rating. This high priority correlates with the emphasis at the federal level to initiate and strengthen infant/toddler programs throughout the United States under PL 99-457 and extended under PL 101-476.

This project has two distinct components: A tangible materials component and another major component, the written materials developed as part of the Parent Early Childhood Series. The second resource/support guide, the Parent Early Childhood Education Series developed by the early childhood staff of the Overbrook School for the Blind, is part of the final version of the Infant Skills materials. This "Parent Early Childhood Education Series," was evaluated extensively by a number of experts in the area of early childhood vision. A number of revisions and modifications were made to the series based on this review. The Parent Early Childhood materials were completed and are available as an APH product.

Based on analysis of the field evaluation data, revisions to the Infant Skills materials as well as to the accompanying activities, were determined. Project staff initiated and implemented the revisions, along with consultation of an educational diagnostician, an occupational therapist, a physical therapist, and a speech therapist to reflect the results of the field evaluation.

Work during FY 1996. The plan for this fiscal year was to have the Infant Skills materials reviewed and evaluated by content/expert reviewers, and then to have selected components of the revised materials evaluated by teachers of infants/toddlers. This project was put "on hold," however, due to other higher priority projects.

Work planned for FY 1997. It is anticipated that this project will continue to be "on hold" during FY 1997.

On the Way to Literacy III (continuing)

Purpose: To provide additional tactile/visual storybooks to be read aloud by an adult to preschoolers who are blind or low vision

Project staff: Suzette Wright, Project Director
Tom Poppe, Model and Pattern Maker

Background. Because of the limited availability of print/braille books with meaningful tactile illustrations for the preschool age group, 10 storybooks were developed as a part of the larger project which produced the handbook, On the Way to Literacy: Early Experiences for Visually Impaired Children. Additional storybooks were requested by evaluators of these books, so On the Way to Literacy II resulted in the production of 3 new tactile/visual storybooks. The current project continues this effort to provide a variety of books in the formats which have been successfully evaluated with students. The storybooks under development will provide text in braille and large print and feature visual and tactile illustrations which encompass a range of types of tactile graphics--from actual objects, to thermoformed objects, to simple raised line drawings.

Work during FY 1996. Five commercially published children's books were identified for development and four original children's stories were written for On the Way to Literacy III. Tactile/visual illustrations for all were designed and sketched; layout of all braille and print text was determined based upon available space. Drafts for each of the nine storybooks were submitted to two consultants and five in-house reviewers. Reviewers commented on the suitability of the text and tactile graphics for the designated audience. Their comments guided revisions of the drafts.

Work planned for FY 1997. Final text will be prepared to give to the Braille Department for braille transcription. Materials will be assembled and molds designed for the books' tactile graphics. Storybooks which rated most favorably will be developed into prototypes. Seven storybooks will be prototyped; four copies of the seven titles will be produced for evaluation with students. Four sites will serve as field evaluation sites, with 6-8 teachers serving as evaluators. Information from teacher questionnaires and child data sheets will guide selection of books to be produced and revisions to be made. A document containing specifications for each of the books to be produced will be written and given to Technical Research staff along with a prototype. From this point, Project Staff will work with Technical Research to provide assistance as needed during the production process.

Preschool Activity Calendar (continuing)

Purpose: To develop a 12-month calendar of daily activities for children of developmental ages 3 to 5 who are blind/visually impaired

Project staff: Sheri Moore, Project Director
Nancy Smith, Project Author
Karen Poppe, Project Assistant

Background. A calendar of daily activity suggestions, developed by Nancy Smith, a preschool teacher/consultant at the Wisconsin School for the Visually Handicapped and Educational Services for the Visually Impaired, was brought to the attention of APH by one of its ex officio trustees, Andrew Papineau, State Consultant for the Wisconsin Department of Public Instruction. It had been published for several years by the Wisconsin Department of Public Instruction for limited circulation under the name Calendar: Everyday Exposure to Experiences for Enjoyment. It is no longer available/published by the State of Wisconsin. The need for easy to use ideas for daily activities that stimulate children with visual impairments prompted the initial development of the calendar. Project staff perceived value in a calendar of this nature, with over 365 activity choices for families of young children who are blind or visually impaired.

The purpose of the calendar activities is to encourage the child and caregiver to explore the home and community environment together. The inexpensive, practical, concrete activities give many suggestions of learning activities that parents and children and siblings can do together. Hopefully, the calendar activities will prompt parents to be more aggressive in exposing their child to household activities and chores and to being more directly involved in their child's intervention strategies. The calendar also includes a narrative text above each month's date grid, with motivational instructional material for parents' use in working with their child. The calendar is designed to be used by parents with the help and support of a vision teacher. Objectives of the activities include: promoting social interaction between the child and his/her parents and siblings, offering multisensory experiences to the child through interaction with his/her environment, and fostering within parents a sense of purpose and hope for the child's growth and development.

Work during FY 1996. The calendar, as published by Wisconsin, was distributed to 20 early childhood vision teachers and special educators. It was also distributed to 20 parents of children with visual impairments for field testing and review. Evaluators used the calendar activities with infants through

children 5 years of age; and with children across the spectrum of vision and other disabling conditions. Data resulting from the field evaluation were analyzed.

The project director and project author worked on making modifications and revisions to the calendar. Collaborative decisions were made about the field evaluation data and revisions/modifications to the Preschool Activity Calendar.

A rationale for use of the calendar activities was written. An introductory piece was developed to better explain the usefulness and purpose of the Activity Calendar. Along with the Introduction, additional sections were developed and written to include examples of analyzing activities into small steps as well as how to adapt calendar activities to varying age groups and abilities.

Work planned for FY 1997. The project director and project author will continue to refine and finalize revisions to the calendar, in collaboration with project staff. The target population for using the calendar will also be addressed within the introductory component along with general guidelines for its use. Calendar modifications will be completed and work will begin on preparing the document for publication. Project staff will prepare a production document and will assist in the preparation of computer disks and artwork. Project personnel will continue to work collaboratively with production staff throughout this process.

Multihandicapped

Making Picture Recipes (completed)

Purpose: To provide a set of picture cards to assemble into picture recipes for use with nonreading multihandicapped low vision students

Project staff: Suzette Wright, Project Director
Mary Zatta, Project Author
Diane Furino-Bleier, Project Author

Background. The purpose of the Picture Recipe program is to provide a means of creating picture recipes to provide cooking independence for low vision students who are beginning or non-readers. The program originated from needs within The Perkins School for the Blind. Teachers found that daily living skills instruction and preparation for future placements into community living warranted the presentation of cooking instruction, but existing picture recipe cookbooks were not suited to low vision students.

The program includes a master set of reproducible picture cards with which to make recipes. The master set of 257 picture cards is organized in the following categories: food items, utensils, processes, appliances, miscellaneous. These are grouped by category in a card file box. Also included is a manual with easy, how-to directions; sample recipes formatted in two different ways; corresponding checklists for assessment; and helpful hints for adaptations.

The program was placed for evaluation at four sites in January 1995; six to nine teachers at each site were identified by their supervisors and invited to participate. Seven evaluators completed and returned the forms. Some of the suggestions for improvements were implemented: addition of master cards to illustrate microwave cooking and cooking of more convenience foods, and reorganization of the cards enabling them to be located more quickly. Additional cards were drawn, a reorganization of the 257 cards was completed, the manual was readied for typesetting, and a cover design was prepared.

Work during FY 1996. Making Picture Recipes was approved for quota sale in October 1995. Making Picture Recipes was turned over to Technical Research with detailed specifications. It was produced, priced, and put in stock.

Work planned for FY 1997. The product is complete. No further work is anticipated during FY 1997.

Move, Touch, Do (formerly entitled "Pragmatic Classroom Units for Young Multihandicapped Children") (completed)

Purpose: To develop a curriculum model, presented in classroom units/thematic units format, that assists teachers of young multihandicapped visually impaired children in developing a methodology and practical approach to teaching, with a particular emphasis on the development of communication skills

Project staff: Sheri Moore, Project Codirector
Debbie Johnson, Project Codirector
Karen Poppe, Project Assistant
Wendy Drezek, Project Author and Codirector
Margaret Costantino, Illustrator

Background. The pragmatic classroom units were developed by Dr. Wendy Drezek, with a similar format to a curriculum model based on the work of Ellyn Lucas-Arwood. Pragmatism is a methodology for facilitating communication for children with language disorders. In this model, language has a social and cognitive base, and is shaped by consequences in the environment. Language is only successful insofar as it results in the intended change in the environment. In the classroom, routines are used to structure a common meaning, and units are used to introduce new concepts and vocabulary. Sign language and other nonvocal techniques are also used with nonvocal and echolalic students. Many of the goals of a pragmatic language approach would be helpful to young students who have multiple disabilities as well as visual impairments. The pragmatic classroom units represent and reflect a wealth of practical information developed by Wendy Drezek over many years of classroom experience. The purpose of the materials is to facilitate communication strategies for young children with multiple impairments. Developing a communication system is a critical need of many students who are multiply impaired. The thematic unit format reflects a national trend in early childhood and primary programs. The purpose of the units is to present skills, concepts, and vocabulary in a rich context of real everyday objects and actions, rather than as isolated splinter skills.

Work during FY 1996. Final editing and formatting of camera-ready copy was completed during FY 1996. The curriculum with accompanying disk became available for purchase.

Work planned for FY 1997. This project is complete and no further work is anticipated.

Multihandicapped Adolescent Project (on hold)

Purposes: To develop a manual of functional and community-based learning activities designed to meet the needs of adolescent multihandicapped visually impaired students

Project staff: Sheri Moore, Project Director
Martha Majors, Project Codirector
Mary Zatta, Project Codirector
Debbie Johnson, Project Assistant
Karen Poppe, Project Assistant

Background. The Multihandicapped Adolescent Project is targeted for students who have achieved basic skill levels and are involved in an educational program emphasizing self-care, domestic skills, independence, and life/community living skills. Written activities include functional and age-appropriate applications, stressing skills useful in a community-based setting. Applications of functional academics are also incorporated into project activities. The manual is also applicable to adolescent students with dual sensory impairments.

During parts of the 1994-95 school year, the Multihandicapped Adolescent Project manual was field evaluated nationally by teachers in 10 programs who worked with students with multiple disabilities at the adolescent level. The field test addressed such issues as the value and usefulness of the materials, the presentation and format of the information presented, and the target populations for whom the materials are most useful. These data from the evaluation were used to determine needed revisions. Necessary revisions include improving the clarity and consistency of the text, formatting for easier use and readability, increasing the application of functional academics, incorporating additional community-based experiences, and strengthening the language/communication component.

Work during FY 1996. While it was planned to make the necessary revisions and have the materials evaluated by expert/content reviewers, this project was put "on hold" due to other higher priority projects.

Work planned for FY 1997. It is anticipated that this project will continue to be "on hold" during FY 1997.

Low Vision

Assessment Program and Intervention Guidelines for Visually Impaired Children (continuing)

Purpose: To revise, update, and augment the University of California Berkeley (UC Berkeley) Assessment Scales for Visually Impaired Children

Project staff: Sheri Moore, Project Director
Amanda Hall, Project Author and Codirector
Deborah Chen, Project Author
Linda Kekalis, Project Author
Debbie Johnson, Project Assistant
Karen Poppe, Project Assistant

Background. The Assessment Scales and Guidelines were submitted by the authors for consideration for publication by APH. The UC Berkeley Assessment Scales for Visually Impaired Children was developed under a grant from the California State Department of Education. The overall goal of the original project was to refine the scales through pilot-testing with a small number of blind and low vision children in the San Francisco Bay Area. The scales examine developmental milestones of particular importance to children with vision loss between birth and 2 years of age.

Work during FY 1996. The Assessment Program and Intervention Guidelines address the following domains: social/emotional development, language development, cognitive development, gross motor development, functional vision, and home environment. After submission, the Assessment Scales for Visually Impaired Children, along with the accompanying guidelines component, were initially reviewed by APH project staff. The program and guidelines were then prepared to be reviewed by several expert/content reviewers. APH staff designed an evaluation plan to collect and analyze the evaluation data completed by the expert/content reviewers. An analysis of these data recommended a number of modifications, additions, and revisions that were suggested by the reviewers. Generally, reviewers felt that the content of the materials was very useful and would be a contribution to the field. Suggestions for additions/deletions/revisions were reviewed and discussed by the APH project director and the authors; a plan was formulated, collaboratively, for revision of the materials. Dr. Amanda Hall and Dr. Deborah Chen worked with the project staff to implement the agreed upon revisions and modifications to the materials. All content was updated and current with the literature base in this field. Dr. Kekalis served as a reviewer of all new content. APH project staff continued to work with the project authors on revisions and modifications. Final drafts of all materials were completed in FY 1996.

Work planned for FY 1997. A final editing will be undertaken, along with all necessary preparations for entering the production process. APH project staff will continue to work closely with the project authors and the in-house production staff throughout the production phase. APH staff will also assist with the production of marketing materials of this product, closer to the date of release.

Individualized Assessment of Visual Efficiency (ISAVE)
(continuing)

Purpose: To develop an assessment instrument useful in evaluating the potential for visual efficiency of young children and young children with multiple impairments, in addition to a visual disability

Project staff: Sheri Moore, Project Director
M. Beth Langley, Project Author
Debbie Johnson, Project Assistant
Karen Poppe, Project Assistant

Background. M. Beth Langley, author of the Functional Vision Inventory, developed an instrument specifically designed to measure visual potential for visual efficiency in visually impaired multiply handicapped children. This instrument was originally entitled the Potential Assessment of Visual Efficiency (PAVE) and is now renamed the Individualized Assessment of Visual Efficiency (ISAVE).

Work during FY 1996. Work progressed on the assessment, with the major undertaking being the final revisions to project materials. The major components of the instrument are as follows: Demographics, Physical readiness, Medication, Time of assessment, Seizure activity during assessment, Reaction to handling, Posture and movement, Structural status, Vision structure and function, Orientation and mobility, Functional use, Physiological status, Visual behaviors, Gaze, Eye movements, Visual fields, Cortical visual impairments status, Acuity, Levels of stimuli and responses, Stimuli processed, Response patterns, Visual perception, Summary and impressions, Current level of visual functioning, Visual variables, and Skills to be developed and/or refined.

An evaluation was conducted and all data were analyzed. Revisions were determined, based on all data collected; decisions were made jointly by the author and project director. Areas of the evaluation that yielded suggestions for revisions/ modifications included: usefulness of the materials, applicability to the target populations, areas of strength, areas of weakness, etc. Necessary revisions were made to the assessment instrument. A final expert, content review was conducted by Dr. James E. Jan of Vancouver University of British Columbia and Childrens Hospital.

Work planned for FY 1997. APH staff will continue to work closely with Ms. Langley throughout the revision process. Project staff will prepare all materials for entry into the production phase and will work with the production staff as needed.

Mini-Lite Box (formerly entitled "Light Tablet") (completed)

Purpose: To develop a light box sized for use on a child's desk and suited for home use by students served by itinerant teachers

Project staff: Suzette Wright, Project Director
Tom Poppe, Model and Pattern Maker
James Robinson, Electronic Designer

Background. During visits in the field, a number of teachers using the Light Box expressed a need for a smaller version of this device which would easily fit on a child's desk or lap. In addition, a smaller, less expensive device could more feasibly be left in the home for use by students between teacher visits. A needs assessment conducted at the international gathering of the Association for Education and Rehabilitation of the Blind and Visually Impaired in July of 1992 gave priority to the need for such a device.

Various commercially available light boxes and light desks manufactured by toy makers were reviewed. The best of these were presented to teachers of infant, preschool, and primary grade visually impaired students. The toy light desks presented, and modifications made to these, did not meet their needs: illumination was insufficient, none featured a rheostat, and safety was a concern. Small commercially available light boxes used by photographers had insufficient illumination and were not dimmable. Technical Research's Electronic Designer researched, designed, and built the electronic circuitry for the new Mini-Lite Box prototype, which features:

- two 8-watt lamps (twice the illumination of similarly sized commercial battery-operated light boxes)
- a rheostat (not available on commercial light boxes)
- optional battery power (six rechargeable Nicad batteries which power the box for up to 4 hours; batteries are recharged while in the box)
- ability to run off standard 120 volt "wall" current (may simultaneously be used for instruction and recharged when plugged into a wall receptacle)
- weight of about 6 pounds or less including batteries

Once the electronic components of the prototype were determined, a shell to house the components was designed. It incorporates a prop able to recline at 10 inclinations and also

serves as the box's carrying handle. Guides to hold overlays in place are featured. A single prototype was formatively evaluated with students in a local preschool program. Two additional prototypes were built and a brief manual was written detailing operation of the light box. Four sites were selected to evaluate the prototypes. In general, teachers were extremely pleased with the size and weight of the Mini-Lite Box. Results of the evaluation prompted several improvements: a separate on/off switch; audible warning beep to indicate low battery power; revised circuit design to provide greater illumination, longer bulb life, and instant "on" capabilities; an adaptive switch jack; and an improved prop design. The circuitboard design was finalized. Case design as it relates to the final placement of all interior components and controls was completed. The instructions accompanying the Mini-Lite were rewritten to reflect revisions to date. The Mini-Lite Box was approved for sale on quota in May of 1995.

Work during FY 1996. During this period, the circuitboard design was fine-tuned to bring the Mini-Lite within FCC standards for a class "B" device; FCC approval was received. Technical Research personnel identified an outside vendor capable of injection-molding the Mini-Lite case, assembling the circuitboard, obtaining all components, and fully assembling the Mini-Lite at its facility. Care was taken to maintain the high quality and capabilities of the original APH-made prototypes. The vendor met all criteria and started production of the first run of 1,000 Mini-Lites.

Accessories to the Mini-Lite include a cover, sold separately, and a set of colored and clear transparent overlays, also sold separately. An analysis of the materials in the Light Box Materials I, II, and III showed that most items can be used on the smaller Mini-Lite. Users, however, may not wish to purchase whole kits. For this reason, five items from the Light Box kits will be sold separately; Plexiglas Blocks (colored acrylic shapes); Spinner and Spinner Patterns (transparent board); Colored Shape Cards (pictured shapes on transparent stock); Familiar Object Pictures (pictured objects on transparent stock). These were selected after polling teachers on the items used most, considering the cost of various items, and the range of their uses. Activities grouped by skill were written to accompany these items; all written materials have been given in final print form and on disk to Technical Research. The separate items have been priced, and will soon be available for purchase.

Work planned for FY 1997. Project staff will work with production and business office personnel as needed during the manufacturing and pricing processes.

Program to Develop Efficiency in Visual Functioning: Addendum (continuing)

Purpose: To provide materials for the development of visual functioning for children who have handicapping conditions in addition to low vision

Project staff: June Morris, Project Director
Carol Roderick, Project Assistant
Natalie Barraga, Project Consultant
Janice Stallings, Project Consultant

Background. The Program to Develop Efficiency in Visual Functioning was published in the early 1980's. When this program was written, the target population was children whose primary handicapping condition was low vision. Since that time, APH has been serving more children with multiple handicapping conditions. This project will provide materials for this population. Materials planned are the updating of the resource guide, additional lesson plans, and a video showing these lesson plans being used with the target population.

Work during FY 1996. The project staff met and determined which lesson plans needed additional steps. Natalie Barraga wrote revisions for the resource guide and Janice Stallings developed lesson plans. Both the lesson plans and updates to the resource guide were reviewed by the APH project staff.

Work planned for FY 1997. APH project staff will meet to discuss revisions needed in the lesson plans. Revisions will be made, and the materials will be field tested. Further revisions will be made based on the results of the field evaluation. A video script will be written, and a video will be produced. The addendum will be prepared for entry into the pipeline near the end of FY 1997.

Braille

Braille Language Program (continuing)

Purpose: To develop a set of beginning language materials consisting of two components, spelling and English, which will minimize problems in these curricular areas commonly encountered by beginning braille students

Project staff: Eleanor Pester, Project Director
Carol Roderick, Project Assistant
Karen Poppe, Project Assistant
Eric Hamp, Linguist
Betty Modaressi, Editor

Background. This project was partially funded under a grant awarded to APH by the Federal Research in Education of the Handicapped Program's Field Initiated Research competition which is administered by the Special Education Programs, Office of Special Education and Rehabilitative Services, U.S. Department of Education. Work began in January 1985 with an analyses of achievement in language, spelling, and word study skills of 57 blind 4th and 5th graders on a special braille edition of the Stanford Achievement Test, Intermediate 1, Form E, to identify specific problems. Current spelling and English textbooks and Patterns: The Primary Braille Reading Program were also reviewed before development of the program began.

The program, which is called Patterns: The Primary Braille Spelling and English Program, consists of four levels, Level A through Level D. Each level of the program was written, reviewed by the committee, revised, pilot-tested, and then field tested with over 50 students and approximately 20 teachers at sites across the country. Criterion-referenced tests were administered as the students completed each level. Test results were sent to APH for scoring and analysis. Although federal support for the project ceased December 31, 1989, field testing continued on the later levels until students completed the program.

Revisions of the materials based on the field evaluations proved to be extensive. Level A was prepared for production and made available for purchase during the 1992-93 school year. Level B was put into production, and became available for purchase during the 1993-94 school year. Field testing indicated that Levels C and D needed the most extensive revisions including reorganization of the material and the addition of instructions and practice for writing with slate and stylus. Level C was revised, completed and turned over to production.

Work during FY 1996. Level C was produced and available for the start of the 1996-97 school year. The revision of Level D was completed. Materials were reviewed by the linguist and the project director and then revised by the editor.

Work planned for FY 1997. Level D will be prepared and turned over to preproduction.

Braille Literacy for the Older Student (new)

Purpose: To develop a complete set of braille materials to introduce the older student both to the necessary skills required for reading up to 4th grade level and to Grade 2 Braille

Project staff: Eleanor Pester, Project Director
Carol Roderick, Project Assistant
Karen Poppe, Project Assistant

Background. Patterns: The Primary Braille Reading Program, successfully teaches children to read using Grade 2 Braille. Unfortunately, some students are too old to use Patterns but they do not have the necessary reading skills to use programs developed to teach adults the braille code. The recent emphasis on the importance of braille literacy and braille bills has increased the number of older students being introduced to both reading and braille. Therefore, it is necessary not only to teach these students the braille code, but reading as well. It is the goal of this project to develop suitable materials for introducing older students to reading and braille.

Work Planned for FY 1997. Outside funding will be sought to carry out this project. Adolescent and adult print literacy materials will be analyzed. Research on teaching adolescents and adults to read both print and braille, characteristics of adolescents and adult learners, and other related topics will be reviewed. An advisory committee composed of blind and sighted individuals who have experience teaching adolescents and adults to read braille as well as experts in literacy for adolescents and adults will be selected and will meet to develop specifications for this project. Development of the materials will begin as soon as the preliminary work is in place.

Braille Literacy: Training, Mentoring, and Technological Services Program for Blind Adults (completed)

Purpose: To develop, in collaboration with the National Federation of the Blind, which worked with APH as a subcontractor, a braille training program for use in rehabilitation centers; an extended training program for use by blind mentors in the clients' home communities; and a publication documenting the potential usefulness of existing braille related technology

Project staff: Hilda Caton, Project Director
Beth Gordon, Assistant Director
Eleanor Pester, Project Assistant
Carol Roderick, Project Assistant
Karen Poppe, Project Assistant
Betty Modaressi, Editor

Background. The initial proposal for this project was submitted to the National Institute on Disability and Rehabilitation Research (NIDRR) in May of 1992 by the American Printing House for the Blind (APH) and the National Federation of the Blind (NFB). Funding for the 3-year project began October 1992.

APH staff conducted a thorough review of research in the areas of tactual development and tactual perception of blind adults and reviewed and evaluated existing programs designed to teach braille to adults. Consultants and staff decided to combine the best sections of existing programs into the new braille reading and writing curriculum guide and to expand the instructor's manual to include teaching strategies. The new curriculum and evaluation materials were reviewed by consultants. APH project staff visited each of the field test sites to observe and answer questions. Once students completed their training in the rehabilitation centers, mentors were selected to work with the students at home. A mentoring manual was developed and the staff and consultants reviewed it. Potential blind mentors were trained in mentoring. The first mentors began working with students in the summer of 1994. Field evaluation of the curriculum guide was completed in December 1994 and field evaluation of the mentoring manual was completed in March 1995. Data from the field evaluations were analyzed and used to make revisions. A final meeting of the program consultants was held in August 1995 to review the revised braille reading and writing curriculum and the mentoring manual.

As part of the goal to develop a publication documenting the potential usefulness of existing braille related technology, technical consultants met in January and May 1993 and completed the initial assessment of technological devices that interface

with computer screens to produce braille output. David Andrews from NFB was primarily responsible for evaluating existing computer hardware, and other consultants evaluated various software programs. The technology consultants met in January 1994 and decided that they would focus on screen-access devices. The assessment update from the 2nd year was completed in September 1994 and prepared for production. It was decided, however, to wait until the 3rd year update was completed and produce one document which contained evaluations from all 3 years. The final update was completed in July of 1995 and included evaluations of screen-access devices.

Work during FY 1996. This project was reported as being completed last year, but due to APH's loss of both the Project Director and Assistant Project Director, it was not completely ready for production. During this fiscal year, the Teacher's Edition, student materials, and practice materials were all checked for consistency, compatibility, and errors; corrections and changes were made. Answers were inserted in the Teacher's Edition and checked. Copyright permissions were secured, and when this could not be done, substitute materials were found or written which served the same purpose as the originals. A preface was written explaining what the role of each agency was in the development of the program, and information was added to the introduction explaining what is included in the program. Simplified rules included in the Teacher's Edition for each unit were also included in a summary at the end of the student materials, along with suggestions in the Teacher's Edition for their use and the use of the contractions chart included in the program. Final revisions were made in the mentoring manual and checked against the recommendations made by the consultants who reviewed it. Several meetings with APH project staff and the Assistant Project Director were held to discuss details of production to insure that the changes being made were in agreement with the original intent of the project. Production specifications were revised to reflect the necessary changes before the program was turned over to preproduction.

Work planned for FY 1997. The final assessment of braille technology submitted to APH for publication will be copy-edited. This information is available on the Internet. The remainder of the program is completed. No additional work is anticipated during FY 1997.

Educational Measures

Career Interest Inventory (continuing)

Purpose: To provide teachers and counselors with an instrument to explore educational and occupational possibilities for students

Project staff: Debbie Johnson, Project Codirector
Debbie Willis, Project Codirector

Background. Level 2 of the 1990 Career Interest Inventory from The Psychological Corporation is a career-guidance instrument designed to provide information about students' educational goals, interest in a variety of school subjects and school-related activities, and interest in fields of work. It is designed to be used primarily with students in grades 10 through 12, as well as adults. It provides information that can be used to help students explore post-secondary educational and occupational alternatives and to plan to make decisions about their careers. After investigating the Career Interest Inventory, it was decided not only to adapt Level 2 into braille and large type, but also the Exploring Interest Inventory, Level 1 for grades 7-9. Permission to adapt was requested and received from The Psychological Corporation.

Work during FY 1996. Levels 1 and 2 were edited and formatted for large type production. A partial preliminary draft of the Administration Manual for the large type test was prepared.

Work planned for FY 1997. After completing the Administration Manual for the large type version of the Career Interest Inventory and reviewing all components, the large type version will be turned over to production. Work on adapting this instrument into braille will then be done and turned over for production as well.

KeyMath Revised: A Diagnostic Inventory of Essential Mathematics (completed)

Purpose: To provide teachers with a measure of understanding and application of important mathematics concepts and skills in grades kindergarten through grade 9

Project staff: Debbie Willis, Project Director

Background. The KeyMath Revised is an individually administered instrument with 13 subtests that will evaluate three areas of mathematics: basic concepts, applications, and operations. The test provides information needed to make instructional and remedial decisions. It also allows the teacher to observe the student's approach to solving problems.

Identification of the need for this instrument came through repeated requests from individuals in the field. Permission to adapt the KeyMath Revised was requested and received from American Guidance Services. This adaptation of the KeyMath Revised is designed to be used by sighted test administrators with visually impaired students who require a braille/tactile version.

Work during FY 1996. Since there was a new project director in fiscal year 1996, Technical Research requested that a sample run of the test volumes be verified and approved before the actual production run. A number of problems were found with the braille, tactile graphics, and print portions of the four test volumes. Changes to these also resulted in changes needed to the print supplementary manual. The plates for the braille and tactile graphics were modified or remade as necessary. Once the braille and tactile graphics were approved, the changes needed to the print in the test volumes were checked and reworked as needed. After the test volumes were corrected and approved, the final changes to the print supplementary manual were completed. The revised volumes were turned over to Technical Research for production.

Work planned for FY 1997. The Project Director will assist production personnel as needed to produce the KeyMath Revised.

Stanford Achievement Series, 9th Edition, Complete Battery (new)

Purpose: To make a widely used comprehensive achievement test battery available in accessible media

Project staff: Debbie Willis, Project Director
June Morris, Project Consultant

Background. The 1996 Stanford Achievement Test (SAT) Series, 9th Edition, from The Psychological Corporation, is a comprehensive achievement test battery for grades K-13. Initially, APH planned to adapt the abbreviated test battery. At each grade level an abbreviated test battery is available that includes fewer subtests than the complete battery and each subtest in the abbreviated test battery is also shortened in length.

Work during FY 1996. While visiting The Psychological Corporation, June Morris and Bill Lohss found out that the SAT Complete Battery is ordered 15:1 over the Abbreviated Test Battery. Calls from consumers of APH test products requested the SAT(9) Complete Battery not the Abbreviated Test Battery. Based on this information, members of the Educational Research and Development Committee at APH's 1996 interim meeting recommended that APH adapt the SAT(9) Complete Battery. Whether need for the abbreviated version will also exist because of time constraints involved in administering the complete version will be determined at a later date. The Committee also recommended that APH begin work on the large type version starting with the middle school grade levels.

The test publisher provided APH with the complete Stanford Achievement Test Series for the 9th Edition. They agreed to renorm the adapted tests with missing items when adaptation is completed. If an item that cannot be adapted has an equivalent item in the item pool that can be adapted, the second will be used in the final version of the test.

Initial work on editing the large type version of the SAT(9) got underway. The first level to be adapted, Intermediate Level 1, required considerable editing due to the complexity of the visual layout, variability in font style and size, and variability in clarity and sizes of images and illustrations. Because a great deal of editing was required on the first level examined, a meeting of APH personnel involved in producing the adapted SAT(9) series was held. Production personnel worked with the test publisher to determine whether the original test materials could be provided in an electronic format usable by APH so that necessary editing could be done directly. It was determined, however, that the electronic format in which the tests exist is incompatible with any of APH's computer systems.

Work planned for FY 1997. At this time, it is anticipated that three of the levels of the SAT(9), SESAT 1 and 2 and Primary 1, will not be adapted into large type or braille due to the almost totally pictorial content. Ten of the 13 levels of the SAT(9) will be edited for large type the administration manuals prepared, and turned over for production as each is completed in the following order: Intermediate 1, 2, 3, Advanced 1, 2, TASK 1, 2, 3, Primary 2 and finally Primary 3.

The plan for FY 1997 is to edit for braille, prepare the administration manuals, and turn over to production the first five levels of the SAT(9) listed above.

Test Needs (new)

Purpose: To determine test instruments needed for academic assessment of blind and visually impaired students or adults

Project staff: June Morris, Project Codirector
Debbie Willis, Project Codirector

Background. The previous Project Director in the area of Test Measures had planned to adapt the following three tests into accessible media:

1. Differential Aptitude Test, 5th Edition, ©1990, The Psychological Corporation

2. Test of Adult Basic Education, Forms 7 and 8, ©1994, CTB/McGraw Hill

3. Test of Written Language-2, ©1988, The Psychological Corporation

Work during FY 1996. The three test instruments listed above were deferred pending a review of test adaptation project priorities. As an initial effort into looking at current test needs, June Morris and Debbie Willis held a meeting at the 1996 International Conference of the Association for Education and Rehabilitation of the Blind and Visually Impaired (AER). Seven people from the field along with the APH personnel discussed some of the issues involved in the academic assessment of blind and visually impaired students as well as some of the tools being used or needed for doing so. A major discussion on the potential benefits, issues involved, and need for investigation and research into computerized testing of visually impaired persons ensued. A number of psychologists and test administrators who were unable to attend the 1996 AER also contacted APH staff to report their interest in this area.

Work planned for FY 1997. A meeting between APH project staff and psychologists, test administrators, and other pertinent vision personnel will be held at APH to determine and prioritize test instruments needed in the vision field.

Mathematics

Elementary Math (continuing)

Purpose: To develop materials to aid braille users in developing understanding of and competence in elementary mathematics

Project staff: Eleanor Pester, Project Director
Karen Poppe, Project Assistant
Carol Roderick, Project Assistant
Rob Meredith, Project Assistant
Suzette Wright, Project Consultant
Tom Poppe, Tangible Materials Designer

Background. Math achievement of students who use braille has consistently been behind that of their normally sighted peers. In recent years, very little research has been done to improve this situation. Teachers of students who are blind, however, have continuously requested special braille curricular materials for math similar to those in the Patterns program developed at APH to teach braille reading. With dramatic increases in the number of blind students mainstreamed and using the itinerant special education teacher model, the math priority determined as part of GOALS 2000, and new standards recently adopted by the National Council of Teachers of Mathematics for the teaching of math, it is appropriate to focus once again on math materials for braille users. This project received special funding as part of a three-year research initiative to develop new products in math, science, and geography.

In an effort to identify specific needs of visually impaired students in the area of math, teachers from the elementary and itinerant divisions of the Association for the Education and Rehabilitation of the Blind and Visually Impaired (AER) were surveyed. Also, an advisory committee met to focus on the needs of young braille users in elementary math, to set priorities for the development of materials, and to determine specifications for the materials to be developed. Other work on the project included a review of the research/literature on math instruction for the visually impaired; analyses of math curriculum guides; a thorough analyses of current textbooks to determine such things as mathematical symbols, terms, and concepts being taught; a search of the catalogs for commercially available math related products; and a review of programs on abacus instruction.

Work was begun on the development of a number of products based on the survey and committee recommendations. Prototypes of the following stand-alone products were developed:

1. Beginner's Abacus and Beginner's Abacus Guidebook
2. Analog Clock Model (with minute indicators)
3. Digital Clock Model
4. Nemeth Code Reference Sheets

5. Number/Fact Cards with an organizational card chart
6. Math Fact Drill Sheets with a slotted self-checking holder
7. Numbered and Blank 100's Boards with manipulatives
8. Video(s) on using the abacus for computation

In addition to the stand-alone aids mentioned above, work was also begun on primary braille math units to use with visually impaired children as either a supplement to the mainstream math program or as a core curriculum.

Work during FY 1996. Work on the stand-alone aids and evaluation materials was completed and the aids were field tested and the script for the video was reviewed. Revisions were made and the products were prepared for preproduction or, in the case of the video, production. Prototypes of eight primary units (some of the original 12 selected were combined or not relevant for the early level) and a general guidebook were developed with guidance from Dr. William E. Leibfritz, math consultant. On July 1, a group of teachers of the visually impaired met at APH to share ideas which they had found to be particularly effective for developing concepts and providing practice materials for their visually impaired primary students. Betty Modaressi, a textbook writer, turned these ideas into teaching strategies for the program.

Work planned for FY 1997. Primary braille units and the general guidebook will be sent out for field testing during the school year. Based on the results of the field testing, revisions will be made and the units will be prepared for preproduction.

Math Facts Sheets: Multiplication/Division and Addition/Subtraction Tables (completed)

Purpose: To provide materials to aid legally blind students in developing understanding of and competence in elementary mathematics

Project staff: Debbie Willis, Project Director
Eleanor Pester, Project Consultant

Background. Members of the Math Advisory Committee that met at APH in September 1994 focused on the needs of young braille users in elementary math and set priorities for the development of materials. The advisory committee recommended that materials which provide practice and reinforce basic math facts be developed. A speaker at the National Council of Teachers of Mathematics conference in Boston spoke specifically on the necessity of students knowing their basic facts in addition, subtraction, multiplication, and division. The idea to design and develop math facts sheets, similar to those readily available for sighted students, was conceived.

Work during FY 1996. Prototypes of three different designs of each set of large print/braille multiplication/division and addition/subtraction math facts sheets were developed. The same reviewers of several other math aids being field tested agreed to evaluate the math facts sheets. A set of each design (6 sheets in all) was sent to five elementary teachers to conduct in-use reviews with braille and large print readers. The results showed that each of the five reviewers totally agreed on the best design for both the braille and large print readers. Reviewers suggested that some textual information accompany the Multiplication/Division and Addition/Subtraction Tables. This information was written, reviewed and edited by members of the Educational Research staff. The product samples with specifications were turned over to Technical Research for the initial production run.

Work planned for FY 1997. No further work on this project is planned.

Math + Language Arts [Fractions] (discontinued)

Purpose: To provide language-based math materials that promote understanding of fractions

Project staff: Debbie Willis, Project Director
Eleanor Pester, Project Consultant

Background. At the 1995 National Council of Teachers of Mathematics Conference, numerous sessions dealt with the fact that mathematics surrounds us in our everyday lives and is applicable in some way to nearly everything. Sessions were given on Math + Science, Math + Art, Math + Music, Math + Language Arts, and more. One speaker in particular spoke on language-based learners. For this type of learner, it is very important to teach mathematics in a language-based context rather than in a purely mathematics-based context. A technique used to enhance a language-based learner's understanding of fractions was presented. The technique is fun and can be used, of course, for all learners. Not only does it promote understanding of fractions, but practices spelling as well.

A similar language-based method usable by visually impaired students for promoting understanding and practicing fractions was conceived. It was initially planned that the product would be a speech friendly IBM compatible disk of problems dealing with fractions that are presented in a language-based context.

Work during FY 1996. Due to the restructuring of the Microcomputer Group, it was decided to pursue an equivalent of a paper-and-pencil version of this product rather than a software-based product. Since work on this project had not been started and since there were other higher priority projects, members of the 1996 interim meeting of APH's Educational Research and Development Committee suggested that this be discontinued as a project and that the idea be written up for teachers to try.

Work planned for FY 1997. No work on this project is anticipated. Time permitting, an article may be written.

Money Handling and Budgeting--A Resource Guide (continuing)

Purpose: To provide the vision field with resources in daily living skills dealing with handling money, money identification, making change, and budgeting

Project staff: Venus Elder, Project Director

Background. The Seventh Microcomputer Advisory Committee gave high-priority to adapting or developing high interest,low vocabulary, age-appropriate software for developmentally-delayed blind students, junior high and above. An advisory committee was formed to identify and determine priorities for this area. Top priority was given to developing materials to assist with the daily living skills of money handling and budgeting. Materials needed to teach and reinforce money handling skills were also discussed and recommended by members of the 1994 Math Advisory Committee.

Work during FY 1996. The project related materials were reviewed and organized. Consultants who teach the target population the daily living skills of money handling and budgeting were identified by members of Educational Research and APH's Educational Research and Development Committee. These consultants were contacted to gather their ideas and suggestions regarding the project. The resources were compiled and summaries of each resource were written. A draft of the resource guide which included a database of currently available daily living materials and aids, was reviewed and edited by an in-house committee; changes were made based on the in-house reviews. Appropriate field reviewers were identified, a questionnaire developed, and a draft of the resource guide was sent to two field reviewers for evaluation. Changes were started based on the reviewers' responses.

Work planned for FY 1997. At the onset of fiscal year 1997, final changes and editing will be completed. The Money Handling and Budgeting Resource Guide will be turned over to Technical Research for entry into APH's production pipeline. Plans are to provide the resource guide in both large print and braille versions.

Microcomputer Applications and Products

APH Internet Activities (continuing investigation)

Purpose: To communicate information and serve customers with electronic file distribution

Project staff: John Hedges, Project Director
Rob Meredith, Project Assistant

Background. An initial meeting with representatives from the Microcomputer Group, members of APH's Educational and Advisory Services and Marketing Departments, and Management was held to discuss the possibility of setting up an APH bulletin board system (BBS). The idea was supported and the Microcomputer Group received approval to develop a plan detailing equipment and personnel requirements in order to set up, operate, and maintain a BBS. This item came out of a need to communicate information and serve customers with electronic file distribution. The intent was to develop a means for customers to access data files, such as the Micro Materials Update and Slate, demo software, like the PC Typer Demo, and customer service fact sheets and marketing fliers.

A review of accessible BBS software identified Wildcat BBS software as both accessible for dial-up and Internet compatible. APH concerns such as staff requirements and electronic mail management, as well as the emergence of standard Internet technologies broadened the project scope. The desire was to include system updates to include Internet access for the CARL ET AL database and integrated electronic mail.

Work during FY 1996. An initial APH Internet account for dial-up access to electronic mail, File Transfer Protocol (FTP) Usenet newsgroups, and World Wide Web (WWW) browsing was established with Iglou Internet Services in 1995 by the Computer Technology Services Department. It was determined that access issues for software and electronic information were being discussed via the Internet. An Internet account was established by the Technology Staff to monitor activity in these areas. Materials accessed included list serves (BLIND-L, GUISPEAK, ICADD, WINDEV-L), newsgroups (alt.comp.blind-users), and reference on the WWW, and software and data files from FTP sites. New software and blindness related products, educational materials, and resources were reviewed. WWW browsing software was tested, including Internet Explorer, Mosaic, Cyberjack Web, Netscape Navigator and Lynx, for low vision, speech, and text-based access functions.

The need to access the Internet as an additional communications tool was identified in a meeting with Dean Brooks, a representative for Iglou Internet Services. An interdepartmental Internet Task Force, was appointed to review options and present recommendations to the APH management. The

task force produced a detailed plan to develop and manage a multifaceted WWW presence, leaving E-mail functions defined as a separate issue. A full Internet WorldLinks account service, including making WWW and FTP host service, and a unique Internet name, called a domain name, defined as "aph.org" were approved and established. Technology Staff negotiated a nonprofit account for free computer account services in consideration for an advertising logo on the APH WWW home page. An initial WWW introduction document was drafted and prepared in Hyper Text Markup Language (HTML) for electronic publication for the first time in late March, 1996. The reference information for the Internet presence has been distributed to various search and reference sites, and submitted to blindness related reference sources. These reference addresses in Universal Resource Locator (URL) form are http://www.aph.org, ftp://ftp.aph.org, and E-mail may be sent to the APH domain name "aph.org," or addressed to staff or departments such as info or sales. A staffing decision placed primary WWW content preparation in the Department of Educational and Advisory Services: Resource Services Network, with the Internet Task Force having an advisory role. The Computer Technology Services staff upgraded internal computer networks and evaluated several E-mail products, selecting a low cost solution.

Work planned for FY 1997. Electronic mail will be moved to a network based solution, with a dedicated Internet gateway planned, thus integrating internal and external messaging. Internal system products will be selected and modified as needed to best meet access needs. Information dissemination procedures will be deployed using Internet compatible solutions. Systems and desktop software will continue to be evaluated to incorporate functions for internal and external communications including information posting and electronic file distribution, with particular emphasis on blind and low vision functionality. The Technology Staff will serve as consultants as needed and will monitor blindness related areas.

Micro Materials Update (continuing)

Purpose: To provide current information on assistive technology and related issues of concern to people with visual impairments

Project staff: Venus Elder, Codirector
Debbie Willis, Codirector
Fred Otto, Copy Editor
Rob Meredith, Project Assistant
John Hedges, Project Assistant

Background. The basis for the Micro Materials Update (MMU) developed from a handout that was provided to attendees at a 1985 Summer Training Session at APH. Afterwards, a Micro Advisory Panel and professionals in the field requested that the MMU become a permanent newsletter to provide ongoing information on access technology for those with visual impairments. Since that date the MMU has flourished and undergone several changes, from a simple printed handout to a high quality publication that is provided in several accessible media.

Work during FY 1996. In an effort to continue disseminating information to the field on APH's microcomputer materials projects, products and services, as well as selected technological needs, applications, products and services pursued outside APH, the Fall/Winter 1995 and Spring/Summer 1996 issues were written and published. Subscriber records had not been updated since the publication's inception and a purging of these records was necessary.

At the request of the Ninth Microcomputer Advisory Committee and echoed by members of APH's previous Educational Research and Development Committees, special articles continued to be included in each issue of the MMU. These articles included features on new technology available from APH, an "Ask Fred" column dedicated to customer questions received by APH's Customer Service personnel, a new products section covering new technology made available by APH, a "Family Focus" section dedicated to the needs of students and parents, a "Funding Finds" section covering resources for funding assistive technology, a "News, Views, and Muse" section covering current tidbits on technology for the visually impaired, and specific articles requested by subscribers and the vision field. This fiscal year, articles of interest included "Windows 95: New Challenges and Opportunities," "Taking Notes Using a Tape Recorder," "APH Gets on the Internet," and "Teaching Visually Impaired Students in a Multimedia Enriched Environment."

The Fall/Winter 1995 publication was made up of 3,200 print copies, 300 cassette copies, and 400 IBM formatted disk copies. Of these, 1,576 print copies, 116 cassette copies, and 240 disk

copies were mailed to persons, agencies, and schools on its subscriber database. The Spring/Summer 1996 publication was made up of 3,500 print copies, 250 cassette copies, and 350 IBM formatted disk copies. Of these, 1,805 print copies, 145 cassette copies, and 262 disk copies were mailed to the above mentioned subscriber base. The remaining copies were placed in stock. The additional copies were sent to individuals, professionals in the field, schools, and agencies as requested, in response to inquiries regarding computer-related products, and as handouts at conferences, presentations, and exhibits, and at demonstrations of computer related products for individuals with visual impairments.

Work planned for FY 1997. The MMU will continue to be provided as a free service to the visually impaired community and those who serve them. In the interest of limited staff time and resources, future issues will be published late in the summer as school year issues. The first 1996-97 school year issue, however, will be published as originally planned in the fall. Each yearly issue will continue to be provided in print, on cassette, as text files on IBM formatted 3.5 inch disks and electronically via APH's Web page.

Microcomputer Access Technology Project for Persons with Visual Impairments (completed)

Purpose: To provide lessons on specific access devices and applications for use by students or clients with visual impairments

Project staff: Debbie Willis, Project Director
Fred Otto, Project Assistant

Background. Members of the Ninth Microcomputer Advisory Committee recommended that lesson plans be developed for specific devices and applications. The Microcomputer Access Technology (MAT) materials, which consist of seven training modules, were written by Linda Bishop and several doctoral students at Peabody College of Vanderbilt University. The packets were field tested at teacher training sites around the country. With the goal of making these training packets suitable for student use as well as teacher use, APH agreed to work cooperatively on this project to review, revise, develop competency quizzes with answer keys, and produce the training modules in accessible media. The AppleWorks, BEX, ProWORDS/ProBRAILLE, Braille 'n Speak, and ZoomText/ZoomText+ Training Modules were produced and made available in accessible formats, packaged together as as set.

Work during FY 1996. A consultant reviewed and edited the Duxbury Braille Translation Program for WordPerfect 5.0 and 5.1. A competency quiz with an answer key was developed. The Duxbury Braille Translation Training Module was completed and turned over to Technical Research for production. This product will be available in large print and recorded formats packaged together.

Because of the vast amount of work required and the outdated information contained in the last module, it was decided not to produce the training module on tactile graphics.

Work planned for FY 1997. The MAT Project has been completed. No additional work involving these training modules is anticipated.

Monitoring Technological Developments and Educational Applications (ongoing activities)

Purposes: (1) To identify and determine priorities for microcomputer materials which support educational needs

(2) To monitor technological developments and educational applications of technology

(3) To disseminate information on current uses of technological aids

Project staff: Rob Meredith, Programmer I
John Hedges, Programmer II
Debbie Willis, Research Scientist
Venus Elder, Research Assistant

Background. This area encompasses a vast amount of dynamic information relative to new developments in the field of assistive technology for the blind and visually impaired. Needs for educational materials that are best presented on and support the use of microcomputers are gathered. Monitoring of technological developments and educational applications of the technology are pursued through various ways and means of communication. Information is disseminated in a number of ways to the field on current trends in and uses of technological aids. These endeavors help keep APH personnel moving forward in the area of technology.

Work during FY 1996. The Technology Staff in the Department of Educational and Technical Research (in transition from the Microcomputer Group) were involved in a wide variety of ongoing activities that enabled them to stay informed of technological developments, educational applications of these developments, and particular computer-related needs of visually impaired persons. Under the umbrella heading of "Monitoring Technology," a number of the more important topics were pulled out and written up under their own headings. These projects included:

APH Internet Activities
Sound Card and Text-To-Speech Experimentation
Technology-Related Field Survey

See the write-ups on each of these projects in the "Microcomputer Applications and Products" section of this report.

As the use of computers continued to increase during FY 1996, trends and changes in the computer industry and in education were monitored through literature reviews, attending conferences, workshops, demonstrations and exhibits, talking with a variety of people involved in computer technology, perusal of

appropriate Internet World Wide Web (WWW) sites, news groups, and discussion groups, and bulletin board services (BBS). Reference material reviewed on a regular basis included PC Magazine, Computer World, The Computing Teacher, RE:view, Technological Horizons in Education Journal, Technology and Learning, Closing the Gap, NetGuide, and several programming journals and tutorials. The Internet and BBS services searched on a regular basis for monitoring vision access materials included the Blazie Engineering BBS and WWW, GW Micro BBS and discussion list, MicroTalk BBS and WWW, CompuServe, GUISPEAK list, Microsoft WWW, RFB & D WWW, Telesensory WWW, and others. Several demonstration programs, updates, and documents were obtained this way for trial review, use, or alternative access. Additional programming software and documentation was accessed from Microsoft Developer Network and Microsoft Visual C++ subscriptions on CD-ROM and Internet WWW.

Technology Staff monitored the progress of screen access programs for Windows. Some of the programs examined were ASAW (Automatic Screen Access program for Windows), JAWS for Windows, outSpoken for Windows, Protalk32 for Windows, Window Bridge, Window-eyes, and Windows Master. The Internet List serves for GW Micro (developers of Window-eyes), Henter-Joyce (developers of JAWS), and MicroTalk (developers of ASAW), were also monitored. Low vision software aides and Windows 95 accessibility features were also evaluated. In addition, the "Bumpy Pictures" product was evaluated for availability from APH.

Conferences, classes, demonstrations, and exhibits attended and participated in during FY 1996 included the 1995 Closing The Gap Conference (CTG) in Minneapolis, Minnesota; the Southern Regional Council of Teachers of Mathematics National Conference in Knoxville, Tennessee; the National Council on Exceptional Children (CEC) Conference in Orlando, Florida; the Kentucky Educational Technology Conference in Louisville, Kentucky; the International Association for Education and Rehabilitation of the Blind and Visually Impaired (AER) in St. Louis, Missouri. The Microcomputer Group assisted in demonstrations on using several of the computer-related products available from APH on display during the APH 1995 Annual Meeting of Ex Officio Trustees. These included the "NOMAD for Macintosh" package and "Using the Companion2000." Other presentations and poster sessions included: "Reading Electronic Text with the Companion2000," given at CTG; "Opening Windows: An Audio Based Tactile Tutorial" given at CEC and AER; the "1995 Technology Related Field Survey Results," given at CEC and AER; and "Inventors and Inventions That Have Aided the Blind," given at Crestwood Elementary, Oldham County, Kentucky.

The Technology Staff worked closely with the Computer Technology Services Department to provided technical assistance in testing and evaluating new software for company use, such as

Windows 95 and Microsoft Office 95 and Microsoft Internet software. Technology Staff helped to research and install project specific computers, components and peripherals for department staff, plan for enhanced networked functionality and future needs, as well as to resolve software and printer operational problems to facilitate workflow and department wide computer use.

Another responsibility of the Microcomputer Group was to provide information on technology to the field. In an effort to continue disseminating information on APH's microcomputer materials, projects, products and services, Technology Staff worked in cooperation with APH's Customer Service personnel to provide information, answers, and suggestions on a variety of questions regarding computer products, services, and issues for consumers as requested. Service was provided on software, including disk replacement and troubleshooting, operation, and vendor information to consumers. Other activities included Micro Material Update reprint permissions, article and technology-related information packet distribution, and a notification letter to ex officio trustees on accessible World Book Encyclopedia product discontinuation. Demonstrations, resources and related information were provided throughout the fiscal year to various individuals visiting APH.

Work planned for FY 1997. Continuation of activities to pursue new applications and adaptations of technology for education in the vision field will include review of information, attending conferences, talking to people in the field, and evaluation of ideas and products submitted from the field.

ProWORDS/ProBRAILLE/ProTERM (completed)

Purpose: To provide a high quality talking word processor, braille translator, and telecommunications program for Apple II computers

Project staff: Rob Meredith, Programmer
Debbie Willis, Project Consultant

Background. ProWORDS, ProBRAILLE, and ProTERM are software products developed by Larry Skutchan and Jeff Wheatley; originally sold by MicroTalk in Texarkana, Texas. They all work with speech and require an enhanced Apple IIe, an Apple IIc, or an Apple IIGS computer, as well as an Echo, Slotbuster, or DoubleTalk speech synthesizer.

After ProWORDS, ProBRAILLE, and ProTERM were discontinued, it became clear that there was still a need for these products, as well as support for the installed base. APH was contacted by Larry Skutchan, President of MicroTalk, to see if it would be possible for APH to carry the products. It was decided that they would be made available and supported, as a single package containing all three programs.

Work during FY 1996. APH staff made some minor changes to the programs and accompanying manuals. The package was completed and turned over to Technical Research for production.

Work planned for FY 1997. This product is complete. No further work is anticipated.

Sound Card and Text-to-Speech Software Experimentation
(continuing investigation)

Purpose: To test and evaluate sound card speech functioning and capabilities for programming in talking software

Project staff: John Hedges, Programmer
Rob Meredith, Programmer

Background. From the increase of sound equipped IBM and compatible computers has come a growing confusion between synthesized speech from a dedicated system and digitized speech that is previously recorded and played on a sound equipped system. In addition, the migration of the speech synthesis software from dedicated hardware to programmable sound hardware has been identified as an avenue to provide more affordable talking software on commonly equipped multimedia IBM and compatible computers. The Creative Labs TextAssist text-to-speech (TTS) software designed specifically for Windows 3.1 and several adapted versions were found to perform only adequately, with limitations that hindered programming use. Microsoft proposed a new Speech Application Programming Interface (Speech API) for Windows 95 to support voice input and TTS output consistently at a system level.

Work during FY 1996. The production version of the Microsoft Speech Development Kit (SDK) was released in early 1996; with compatible TTS engines began to be available in the second quarter of 1996. A beta version of the DECtalk SDK for Windows 95 was field tested. The Lernout and Hauspie SDK was also evaluated. The functionality of the Windows 95 software programming method for sound cards was thus able to be evaluated through these third-party TTS engines. The Windows Speech API was found to provide programming access to a variety of Windows compatible sound systems and text-to-speech engines for use in talking software.

Work planned for FY 1997. Evaluations of beta and release versions of text-to-speech software designed for the Microsoft Windows Speech API will continue. Inclusion in software for production will begin sometime after in-house testing and reviews are completed.

Technology-Related Field Survey (completed)

Purpose: To determine technology in use in order to be able to respond to the needs of the vision field with regard to technology

Project staff: John Hedges, Project Codirector
Debbie Willis, Project Codirector

Background. In order to determine and be able to respond to the needs of the vision field with regard to technology, the Microcomputer Group drafted a Technology-Related Field Survey form in January 1995. The survey of hardware, software, adaptive technology, and unmet needs in the field, along with a cover letter, was sent in February 1995 to each of the 44 Alliance for Technology Access Centers across the country, to members of four divisions of the Association for Education and Rehabilitation of the Blind and Visually Impaired [Technology, Elementary, Secondary, and Itinerant], to all ex officio trustees of APH, and to everyone on APH's Micro Materials Update mailing list. A total of 7,874 survey forms were sent; 7,615 were mailed within the U.S., 122 to Canada, and 137 to foreign countries. In addition to these, the Tech-Related Survey forms were given to interested persons attending the 1995 California Transcribers and Educators of the Visually Handicapped Conference. Copies were also made of forms by people who had received them and were shared with colleagues. There is no way, therefore, to know exactly how many total copies were distributed.

Completed or returned forms started to be received almost immediately. An electronic database for entering and compiling the returned data was set up using dBase III Plus. A total of 760 completed surveys were received and recorded in the database.

Work during FY 1996. Results were analyzed and a summary report published in the Spring/Summer 1996 Micro Materials Update. A detailed report based on (a) total computer users and (b) users by category (none, K-12, college, vocational rehabilitation, and other) was prepared for electronic publication on the APH World Wide Web Home Page and for distribution by electronic mail or File Transfer Protocol. Paper and disk copies were also distributed during poster sessions at the 1996 National Council of Exceptional Children Conference and 1996 International Association for Education and Rehabilitation of the Blind and Visually Impaired Conference.

Worked planned for FY 1997. The report will continue to be made available. No further work on this project is planned.

Workbooks On Disk (formerly Math Drill and Practice Programs) (new)

Purpose: To develop math software programs based on selected workbooks from the 1996 Scott Foresman Exploring Mathematics series

Project staff: Rob Meredith, Project Codirector/Programmer
John Hedges, Project Codirector/Programmer
Venue Elder, Project Assistant
Debbie Willis, Project Assistant

Background. At the Seventh and Eighth Microcomputer Advisory Committee Meetings, the participants recommended using an authoring program to adapt or develop some math drill and practice software. Participants of the Math Advisory Committee Meeting held at APH in 1994 expressed great need for materials for students to use to practice and reinforce basic math skills. The need for accessible math software was reinforced by teachers, resource personnel, and computer coordinators in response to a software survey conducted by APH in 1995. Since two of the National Education Goals 2000 pertain directly to mathematics and other goals involve increasing the graduation rate and the necessity of every adult American possessing the knowledge and skills necessary to compete in a global economy, and since blind students typically fall behind their sighted peers on standardized math tests, it was determined to be an appropriate and worthwhile project to pursue a software based math program.

Work during FY 1996. Since APH will be producing textbooks for grades 3-8 from the Scott Foresman 1996 Exploring Math series in large print and braille, it was decided that two of the workbooks from this series would be converted into software programs. These programs will be based on the Microsoft Windows 95 operating system, and will support speech and large print.

Work planned for FY 1997. Programming will begin early in FY 1997. Assistants on the project will help design the software and will help determine how a number of activities and concepts originally presented in a print format can be modified for speech output. Members of the Technology Staff will meet with a small group of educators in the field at the 1996 Closing The Gap conference in Minneapolis, Minnesota. Issues related to developing the programs, as well as unique features which should be included in them, will be discussed at this meeting.

Science

Brain Quest: Science 1000 Questions and Answers (new)

Purpose: To provide materials for visually impaired students that will test and expand their knowledge of science

Project staff: Karen Poppe, Project Director
Sheri Moore, Project Consultant
Debbie Willis, Project Consultant

Background. In the process of reviewing a number of science materials for possible adaptation, Brain Quest®: Science 1000 Questions and Answers was identified by project staff as excellent commercially available material which could easily be adapted into braille and large print for use by blind and low vision students in upper elementary and middle school. The questions are appropriate for students in mainstreamed or residential settings. While the questions are educational, the format is fun and motivating. Learning in a game-type fashion can be done with a partner, in teams, or individually. Questions are separated into seven categories: body and mind, planet earth, the universe, plant and animal kingdoms, life processes, atoms, or mixed bag.

Work during FY 1996. The publisher of the Brain Quest® series, Workman's Publishing, was contacted by project staff regarding permission to make Science 1000 Questions and Answers available from APH in accessible media. At the time of the 1996 interim research and development meeting, permission had not been obtained. Because of the extreme popularity and usefulness of these materials, APH's Educational Research and Development Committee highly recommended that permission be pursued. This task was turned over to APH's Permissions Librarian.

The Associate Publisher of Workman's Publishing called to extend verbal permission, with written permission to follow, for APH to make braille and large print editions available when packaged with a commercially available set.

Work planned for FY 1997. The project director, with advice as needed from APH project staff, will design and develop large print and braille versions of the Brain Quest®: Science 1000 Questions and Answers. The materials will be reviewed in-house as they are developed, a field evaluation form will be developed, appropriate reviewers in the field will be identified, and the materials will be sent out for review. After necessary modifications have been made and a production document with specifications written, the Brain Quest®: Science 1000 Questions and Answers will be turned over to preproduction.

Science Activities for Preschool and Primary Visually Impaired Children (new)

Purpose: To develop a manual of active, hands-on, learning activities emphasizing basic science concepts, targeted for young children 3 years through grade 2

Project staff: Sheri Moore, Project Codirector
Karen Poppe, Project Codirector

Background. With considerable frequency, learners with visual impairments are exempted from science experiences that involve hands-on participation. Initial science concepts are critical for young children as a basis for building more advanced concepts.

Work during FY 1996. Background information was collected; specifically the Science Literacy Benchmarks were reviewed and are studied. The benchmarks reviewed are designed to detail specific competencies that young children (k through grade 2) should achieve in science. In addition, some 40 books and manuals of science activities for young children were reviewed. A detailed compilation was made of the concepts and activities that involved the child actively in the learning process. These concepts and activities were categorized into major content areas such as: water, air, plants, animals, earth, environment, etc. A review was completed of the concepts that appeared most frequently in the 40 science activities manuals that were surveyed.

Project staff met with two science consultants, who also teach young children. Along with the other background information, an overarching framework was developed. A comprehensive listing of science concepts to include in the manual was developed; the determined concepts of interest were arranged into two main categories defined as "Living" and "Non-Living" Matter. Much discussion centered around adaptation of science activities to actively and meaningfully involve the children with visual impairments. Project staff also met with development staff from two institutions that produce excellent science materials for young children--the Roger Tory Peterson Institute (Jamestown, NY), and the Lawrence Hall of Science (Berkley, CA). Project staff will pursue possible collaborative relationships with both the Roger Tory Peterson Institute and the Lawrence Hall of Science in the areas of science and integrated math and science. Work proceeded on writing and developing the science activities, along with appropriate adaptations for children with blindness and visual impairments.

Work planned for FY 1997. Science activities development will continue, along with adaptations for visually impaired

children. Activities will be expanded and further developed. The general format of APH's Hands On: Function Activities for Visually Impaired Children will be utilized. This format has been well received by consumers, and emphasizes activities that build concepts for all young children, with specific adaptations for visually impaired children.

Tactile Graphics

Basic Science Tactile Graphics (new)

Purpose: To create a set of tactile graphics to accompany elementery science textbooks, with special features to make reading them easier and with instructional hints included

Project staff: Fred Otto, Project Director

Background. Because of special monies allotted for the purpose, and with the recommendation of the 1995 Educational Research and Development Committee, it was decided to produce materials in the area of science. A review of texts in elementary science revealed that, before grade 4, most illustrations consist of photographs with very little content conveyed. Textbooks for grades 4-6, in comparison, contain many illustrations that can be turned into meaningful tactile graphics. Since much of the material covered in grade 4 is revisited in grades 5 and 6, it is reasonable that a set of well-designed graphics would be useful at any of these grade levels.

Work during FY 1996. In early 1996 a textbook review was done to identify commonly taught concepts in grades 4-6. Late in the fiscal year meetings were held with transcribers in APH's Graphics Department to discuss how each of these concepts could be made into a meaningful tactile graphic.

Work planned for FY 1997. Drawings made by the Graphics Department will be sent to an expert reviewer for critiquing. Samples will be made from the revised drawings and sent out for field testing early in 1997. A final set of graphics and a guidebook will be turned over to preproduction to complete the project.

Early Math Concepts (Tactile Treasures) (new)

Purpose: To provide an informal assessment and teaching tool for use with totally blind children at the preschool, kindergarten, or first grade level. The purpose is to develop understanding of basic concepts and vocabulary that are prerequisites for reading and math, such as positions, comparisons, and shapes

Project staff: Karen Poppe, Project Codirector and Author
Venus Elder, Project Codirector
Fred Otto, Project Consultant

Background. The need to develop tactile graphics to teach early childhood math-related concepts has been identified by several sources, most recently by APH's Educational Research and Development Committee during the October 1995 Annual Meeting.

The first steps involved review of past research, particularly the Boehm Test of Basic Concepts, and the construction of a comprehensive list of math concepts addressed in major early childhood curricula. Concepts were grouped into six main categories: prereading/page orientation, shapes, one or more comparisons, positional, amounts, and sizes.

It was decided to use thermoformed objects, which proved to be appealing and stimulating to young blind students. Past research has shown that young children can more easily recognize common objects tactually than they can abstract forms or shapes.

Work during FY 1996. Early In FY 1996 a set of thermoformed prototypes was developed for preliminary field testing with the accompanying scripts. Each of the tactile pages has two different thermoformed objects for use with two corresponding scripts. In January 1996 pilot tests were conducted at local schools with young blind and visually impaired children. A meeting with teachers at the Kentucky School for the Blind to review project materials was also held. The materials were very favorably accepted in all cases.

In June 1996 a more extensive set of field test samples was assembled and sent to sites in Arizona, California, and Missouri having summer programs, again receiving positive responses and helpful suggestions. A complete set of all project related materials, including the thermoformed sheets in binders and teaching scripts in large type and braille, were turned over for production at the end of the fiscal year.

Work planned for FY 1997. Project staff will monitor reactions to the materials when the product becomes available. Later on, a comparable set of raised line or embossed drawings

may be considered as a further aid in teaching the progression from concrete to abstract.

Geometry Tactile Graphics (completed)

Purpose: To create a set of tactile graphics to accompany any standard geometry textbook, with special features to make reading and measuring them easier and with instructional hints included

Project staff: Fred Otto, Project Director
Tom Poppe, Project Assistant

Background. Work on this project began in late FY 1995 with a textbook survey, which produced a list of about 50 commonly taught illustrations or proofs. These were drawn onto a set of computer files using a drafting program.

Work during FY 1996. The geometry drawings were etched onto plastic plates using a computer-driven router. Molds were made from these plates, and these molds were used to make thermoformed samples. A guidebook was written, and the product was field tested and turned over to preproduction. A thermoformed protractor was developed and tested as well and will be included in the product.

Work planned for FY 1997. No further work is planned for this project.

Tactile Graphics Research (continuing)

Purpose: To refine in-house procedures for making tactile graphics and evaluate products submitted from the field

Project staff: Fred Otto, Project Director
Tom Poppe, Project Assistant

Background. APH has a variety of means for producing tactile graphics available to it, including embossed paper, puff ink, capsule paper, and thermoform. To produce the highest quality graphics there must be an understanding of which media are suited to which kinds of uses and what the costs are of each.

In addition, tactile graphics products are frequently submitted by teachers or other professionals who would like APH to assume responsibility for producing the materials. Some of these are well researched and well crafted and merit serious consideration. Often the technology and methods APH employs for production differ from those used by the authors, and so a thorough understanding of what the APH processes are capable of will affect the decision.

Work during FY 1996. Response to the graphics produced by the computerized router/thermoform process was excellent, and it appears it will be suitable for many products.

An investigation has begun into the availability of a high-quality capsule paper that came from a paper company in Wisconsin. So far it appears to be unavailable, but if the company can be persuaded to reintroduce it, there could be applications for it at APH.

A set of kindergarten-level graphics teaching shape recognition and positional concepts sent in from the field was evaluated by teachers. The project was rejected because of the number of extra items teachers would have to use and because the author in Norway couldn't be reached. Another submission was a proposal for a set of tactile mazes. The designer has been asked to send a complete description and background materials so APH staff can evaluate them.

Work planned for FY 1997. A legibility comparison of thermoform vs. puff ink graphics is planned. The collaboration between Educational Research staff and the Graphics Department should result in some in-house standards regarding when to use which medium and what symbology is appropriate in each case.

Submissions (such as the tactile mazes) will be handled by APH's review procedure, which may or may not result in their becoming products.

Tactile Human Anatomy Atlas (new)

Purpose: To make available a set of detailed anatomical tactile graphics with instructional texts, suitable for middle- and upper-grades students

Project Staff: Fred Otto, Project Director
Tom Poppe, Pattern Maker

Background. For several years the Tactile Human Anatomy Atlas has been available in limited supply from its authors at State University of New York at Buffalo. They approached APH about taking over production of some or all of the graphics, as they cannot keep up with the demand. APH will take about half the original number of drawings and, making molds of the foil masters, produce in quantity an anatomy volume that can be used by students from middle school on up.

Work during FY 1996. Permissions and ownership agreements were finalized. The creators of the graphics touched up the original foil drawings and sent them to APH in batches. As the masters were received, molds were made from each. The texts that go with the drawings were edited to make them more useful to a nonspecialized audience.

Work planned for FY 1997. Production will begin when all the molds have been made and the accompanying texts have been edited. The project will be completed during the first half of FY 1997. The foil masters will be returned to the authors.

Other Activities

Quota Registration Study--A 1995 Replication(completed)

Purpose: To analyze and describe the legally blind population registered through APH

Project staff: Karen Poppe, Project Director
John Hedges, Programmer II
Debbie Willis, Project Consultant
Gene Bolin, Contributing Editor
Fred Otto, Contributing Editor

Background. Legally blind students are registered with the American Printing House for the Blind (APH) annually for purposes of the federal Act to Promote the Education of the Blind of 1879. This census is used to determine the number of eligible students enrolled in various schools and agencies in order to allocate funds to be used for the procurement of books and educational materials produced by APH for the blind and visually impaired. Periodically, in-depth studies of these data are conducted to discern trends and to document general characteristics of this relatively small, yet diverse, population.

Work during FY 1996. In the early months of 1996, research staff used a dBase III set of applications to generate the needed information for the analysis of the 1995 Registration data. Provided were the numbers of students reported in each program type (4 categories), grade placement (20 categories), reading medium category (5 categories), and visual acuity category (9 categories); student age was also calculated. The computer program provided, in tabular format, the combined analyses of these variables, showing the distribution of students by one, two, or three defining factors. A total of 19 tables was generated based upon the 1995 Registration data. Some data were modified for the purpose of the analysis; omission of some students was necessary to eliminate ambiguous data and to make the study more experimentally sound and consistent with past studies. Consequently, a total of 2,416 students was deleted from the final 1995 Registration figures. Thus, the analysis was based upon the data of the remaining 52,347 students or 95.6% of the total number registered as of January 3, 1995. A formal and detailed report entitled, "Distribution of Quota Registrants in 1995: Program Type, Grade Placement, Visual Acuity, Reading Medium, and Age," was completed in April and describes via a table-by-table discussion, the legally blind student population of 1995. Additional attention was given to comparing the information examined in this report to the two most recent in-depth studies by Wright (1988) and Poppe (1991). Several pie charts and bar graphs included in the report illustrate important findings of the study. Print copies of the report were prepared in May and distributed to all ex officio trustees, as well as to others requesting a copy.

Work planned for FY 1997. The full analysis of the 1995 Registration data has been completed. Available copies of the report will continue to be distributed upon request.

School-to-Work Portfolio Project (continuing)

Purpose: To develop specific materials for blind, low vision, and multihandicapped students, age 14-21, that prepare them for the world of work. Areas of emphasis include: organizational skills, self-awareness and self-advocacy, work exploration, job-seeking skills and job-keeping skills.

Project staff: Debbie Johnson, Project Director and Coauthor
Karen Wolffe, Coauthor

Background. In light of bleak employment figures for people who are blind and low vision, the development of student materials in the area of career preparation was prioritized by the 1993 APH Educational Research and Development Committee.

APH staff subsequently conducted a literature search in addition to identifying best programs, personnel, and practices in the area of school-to-work education. As a result, a database of professionals has been created, focus groups have met to help develop and refine the project, materials from around the country have been collected for the APH library, and an extensive bibliography of literature and products available both in regular and special education has been assembled.

Dr. Karen Wolffe was selected to collaborate on the project. Dr. Wolffe not only holds a PhD in Rehabilitation, but has served on the faculty at the University of Texas, authored numerous publications in the area of transition, and at present operates a private consulting firm serving both agencies and individuals who are blind. Dr. Wolffe conducts basic research on issues regarding career preparation for students who are blind, is a frequent presenter at conferences around the country, consults with numerous agencies and associations in the design of service delivery systems, and authors articles and books on the topic of transition and blindness.

Work during FY 1996. A three-component product--the Transition Tote System--has been designed. It includes a carry-all/organizer (the Tote), a Student Manual, and a Companion Guidebook. Each component embeds high performance expectations for students, self-monitoring and motivation, and a team-based, experiential approach to accomplishing goals. The Student Manual offers over 30 lessons and accompanying activities in areas of organizational skills, self-awareness, career exploration, job seeking, and job keeping. The Companion Guidebook targets those in a "helping" role to the student, offering information about blindness relative to work and suggesting adaptations to the Student Manual lessons to accommodate varying cognitive functioning levels. The Tote case provides a system of organization and presentation of training- and work-related

documents that encourages students to function with a high degree of independence. These materials have been field tested during the summer of 1996; evaluation reports are currently under review.

Work planned for FY 1997. The Transition Tote System was approved for production as a quota item at the May 1996 meeting of the Educational Research and Development Committee. Materials will be revised as warranted by field study results. After necessary revisions have been finalized and production specifications written, the Transition Tote System will be turned over to Technical Research for entry into APH's production pipeline.

Technical Research Division

Technical Research Division

Purpose: To prepare and introduce new products to APH's production process and to adapt or develop products involving technology

Division staff: Bob Phelps, Manager
James Robinson, Manufacturing Specialist
Frank Hayden, Manufacturing Specialist
Darlene Donhoff, Technical/Clerical Assistant

Work during FY 1996.

Analog Clock Display--Redesign. (new product) Technical Research staff worked with APH's model maker to redesign the current clock face. Technical drawings by the model maker were computer-scanned and converted to files on disk. The files on disk made it possible for a computer controlled router to cut out a pattern. The pattern was then used to make prototypical parts for field testing. The technical drawings were also used by a vendor to produce a production mold and will be used to make a silkscreen for the print artwork of the clock face. Once the product design is finalized, product documentation will be completed and turned over to production.

Big Cell. (completed) Technical Research and Model Shop staff worked to locate a vendor. Grish Plastics was selected to manufacture the Big Cell. Molds were developed and sample parts were sent and approved by APH. Raw material part numbers and a preliminary bill of materials were entered into the computer system. A purchase order for 1,765 Big Cells was completed. The Big Cell will be sold both as an individual item and as part of the Braillewriting Dot By Dot kit.

Big Picture. (completed) Technical Research examined the product for the best way to produce it and located a vendor to manufacture the product for APH. Radio Sound was selected to build the units. Part numbers and bills of materials were entered into the computer system. In order to demonstrate the units at various conferences and to be able to loan units on request, prototype units were initially built by Technical Research staff.

Braille Connections. (new product) This product is a braille reading and writing program for former print users, and was turned over to Technical Research for entry into the production process. Two kits will be

produced: the Teacher's Kit in Braille and the Teacher's Kit in Print. Each kit contains a Teacher Manual, Student Workbook, Student Practice Book, and a Mentoring Manual. The Teacher Manuals, Student Workbooks, Student Practice Books, and Mentoring Manuals will also be sold individually in both print and braille. This is a total of 10 individual products. Work involved in getting each of these into production was started; new catalog numbers were entered into the CA computer system on each individual part. Documentation was developed for the production and packaging of each product. Technical Research will provide any assistance required as each product goes through production.

Braille Transcribers' Kit: Math. (new product) Technical Research worked with Educational Research on developing sets of embossed graphics of generic mathematic symbols for braille transcribers to use. Several meetings were held to determine which graphics to include in the sets. Samples were made to acquire outside evaluations from transcribers. Changes were made based on the reviews, and work was begun to document the production of this kit.

Braillewriting Dot by Dot. (new product) Technical Research received this product from Educational Research. Individual braille and large type kits were produced. The Big Cell and Peg Slate are items included in the kits. Part numbers and bills of materials for each kit were entered into the CA computer system. Production documentation and all materials were turned over to the appropriate departments for implementation of the first production run of these kits. The production run was for 250 print kits and 35 braille kits. The exercise cassette is available individually as well as the manuals in print and braille and the alphabet reference sheet in braille. Kits were packaged in large ziplock bags for storage of components.

Geometry Tactile Graphics. (new product) This product was turned over to Technical Research for documentation of production procedures. Technical Research worked with Educational Research to make computer generated art. This artwork was then used on the computerized router to make all the master patterns needed for the thermoform molds. Documentation is being completed so it can be turned over to production.

Grid Papers-Low Relief. (completed) APH's Braille Division requested Technical Research's help in developing three different sizes of low relief grid paper for use by braille transcribers. Production documentation was completed by Technical Research and turned over to Braille. The first production run of each size was completed and placed in stock. Some customers contacted APH requesting several changes in the grid papers. Technical Research modified the designs and the next production run will reflect the requested revisions.

Handi-Cassette II. (completed) Technical Research worked extensively with Aaron Shrenker of Electronic Component Service (ECS) in designing and building a small cassette tape player/recorder for APH. Once all features were determined by APH and relayed to ECS, an acceptable unit was developed. ECS's proposal was accepted and a purchase order was issued to begin making the tooling necessary for building the units. Samples were sent to APH for approval by Technical Research. The company in China manufacturing the Handi-Cassette II requested that a APH representative come to oversee the beginning of the first production run. Bob Phelps went to China and worked closely with the technicians and production people to assure that they understood what was wanted. After many small changes, the first shipment of the Handi-Cassette II was produced. A partial shipment of 250 units were sent so that APH could have them in time for summer conferences. The unit was very well received; the entire initial shipment was sold during the conferences. The completion of the first shipment was received early in August. These units passed APH's quality control inspection. In the meantime, China began work on the next run of circuit boards with the changes requested already built into them. A sample with the new board was received at APH, and a few problems were found. This information was relayed back to the Chinese who made the necessary corrections and started the next production run.

Handi-Cassette II Carry Case. (new product) Technical Research worked on designing a carrying case for the new Handi-Cassette II. Prototypes were made and shown to various personnel at APH for their evaluations. Once a prototype met with everyone's approval, it was sent to Electronic Component Service to look at making it. Several sample cases were sent before APH received a sample that was approved; an order was placed for 5,000 cases. The cases were received, checked by Quality Control, and placed into stock.

KeyMath Test: Braille Edition. (new product) This product was turned over to Technical Research to begin production documentation. After work was started and a sample of the four-volume test was run, project staff in the Educational Research Department determined there were some changes which needed to be made. These changes are being made and when they have been completed, the product will be turned back over to Technical Research.

Light Box. (completed) Technical Research assisted the Educational Aids Department with a problem involving the testing procedures for the assembly processes for the Light Box. Technical Research, working with Underwriter's Laboratory personnel, established a sensitivity standard for the test equipment. Technical Research modified the two test fixtures for checking ballast and dimmer wiring. A different dimmer was purchased but there was a problem with how it was to be wired to the ballast. Technical Research worked with both supplier and manufacturer of the dimmer to determine what the problem was. Once the problem was determined, the necessary documentation was written and given to APH's Manufacturing Department.

Making Picture Recipes. (new product) This product was given to Technical Research to get into production. Along with a new catalog number, part numbers were entered into the computer system. Work began on finding a card file case which would meet the project developer's specifications. A card file case was approved, ordered, and received. Documentation was written on how the pictures were to be made and packaged. This was all turned over to the appropriate departments doing the work. The first production run has been completed.

Microcomputer Access Technology (MAT) Training Modules. (new products) MAT Training modules consist of six different products. The first five of the training modules, AppleWorks 3.0, BEX 3.0 and 3.1, and ProWORDS and ProBRAILLE, Braille n' Speak, and ZoomText and ZoomText+, were completed and turned over to Technical Research prior to FY 1996. The first four of these were produced and available from APH prior to FY 1996. Production documentation was prepared for the fifth training module, ZoomText and ZoomText+. This module was produced and made available. The last of the training modules, Duxbury Braille Translation Program for WordPerfect 5.0 and 5.1, was received. Production documentation was prepared for this product's entry into APH's production pipeline. Similar to the first

four modules, these two modules consist of a manual in large print and on cassette tape, packaged together in a binder.

Mini-Lite Box. (new product) Technical Research, Educational Research, and Model Shop staff worked together on designing a portable Light Box. This included designing a circuit board, the case, and all the fixtures needed to build it. Sample parts and materials were ordered, and several prototype units were built. The prototype units were sent out for field testing which resulted in some excellent suggestions for modifications. The changes suggested were implemented in the new prototypes. Bid packages were drawn up and sent to vendors for quotes on making the parts. A Mini-Lite Box prototype was sent for Federal Communications Commission (FCC) testing and some small problems were found which needed to be corrected. Technical Research made the necessary changes and sent the unit back for retesting. The revised unit passed the FCC testing. A vendor was selected and samples were made for APH to approve. Once APH approval was given, the first production run was started.

Mini-Lite Box - Colored Shape Cards. (new product) As recommended by the project director, it was decided the Colored Shape Cards would be made available separately for use with the Mini-Lite Box as well as package in the Light Box Materials Level II kit. A catalog number was requested and received. The production documentation which included a print information sheet, activities sheet, and parts list was developed. Meetings with key personnel involved in getting this product through production were held. Decisions regarding packaging were made and appropriate packaging to use was found. Documentation was completed and turned over to the production areas.

Mini-Lite Box Cover. (new product) Technical Research worked with the project developer of the Mini-Lite Box to design a cover for it. A vendor was selected to make samples of different designs. Changes were requested and made. Additional changes were suggested and the vendor was asked to make another sample according to the latest specifications.

Mini-Lite Box - Familiar Object Cards. (new product) As recommended by the project director, it was decided that the Familiar Object Cards would be made available as a separate item for use with the Mini-Lite Box as well as a component of the Light Box Materials Level II

kit. A catalog number was requested and received. The production documentation which included a print information sheet, activities sheet, and parts list was developed. Meetings with key personnel involved in getting this product through production were held. Decisions regarding packaging were made. Appropriate packaging was found. Documentation was completed and turned over to the production areas.

Mini-Lite Box - Pegs and Pegboard. (new product) As recommended by the project director, it was decided these parts would be made available for purchase separately as well as part of the Light Box Materials Level II kit. A catalog number was requested and received. The production documentation which included a print information sheet, activities sheet, and parts list was developed. Meetings with key personnel involved in getting this product through production were held. Decisions regarding packaging were made and appropriate packaging was found. The documentation was finished and turned over to the production areas.

Mini-Lite Box - Plexiglas Blocks. (new product) As recommended by the project director, it was decided to make this part available for purchase as an individual item, separate from the Light Box Materials Level I kit. A catalog number was requested and received for this item to be sold as a separate component. The production documentation which included a print information sheet, activities sheet, and parts list was developed. Decisions regarding packaging were made and appropriate packaging was found for the product. All documentation was completed and turned over to production.

Mini-Lite Box - Plexiglas Spinner & Spinner Overlays. (new product) As recommended by the project director, it was decided to make these parts available for purchase separately as well as part of the Light Box Materials Level I kit. A catalog number for these parts was requested and received. The production documentation which included a print information sheet, activities sheet, and parts list was developed. Meetings were held with key personnel involved in getting this product through production. Decisions regarding packaging were made and appropriate packaging was found. Documentation was finished and turned over to the production areas.

Mini-Lite Box - Transparent Overlays. (new product) This was the only new product designed for use with the Mini-Lite Box. The overlays are transparent vinyl

plastics in five different colors: red, blue, green, yellow and clear - matte. There is also a flexible clear sheet included. These sheets are 9 x 12 inch in size to fit the Mini-Lite Box. A vendor was contacted to make the overlays. An order was placed and the materials were received. Preliminary bills of materials were designed and given to Engineering to revise the bill and to develop routing procedures for the kit. Technical Research completed production documentation and turned it over to the appropriate departments.

Move, Touch, Do. (new product) This product was turned over to Technical Research for production documentation. It consists of a binder with a packet of letters for parents, and a disk which has charts, forms and the parent letters. The binder required inserts for the cover and spine. A catalog number and part numbers were requested and entered into the computer system. Documentation was completed and turned over to production. The product was completed and placed into stock.

NOMAD Upgrade-Touchblaster. (completed) Quantum upgraded the software for NOMAD from version 4.0 to 6.0. Technical Research checked the 6.0 version and found there were some bugs in the software for NOMAD configuration. Quantum located and corrected the bugs, but the new NOMAD program would not install properly. Technical Research, in collaboration with the Microcomputer Group in Educational Research, rewrote the installation program to make installation of the software version 6.0 easier. The revised installation program accounted for all different conditions of user installation such as first time users of NOMAD or existing users with version 4.0. Technical Research made master disks which were needed for disk duplication.

Number Line Device--Redesign. (completed) Technical Research personnel worked with the Model Maker to redesign the Number Line base. The redesign has less parts to assemble and the holes are drilled using the computer controlled automated router instead of drilling by hand. Production documentation was written and turned over to production at the start of the first run. The redesign and computer controlled drilling resulted in a reduction of labor time and overall cost of the product. When the bases were drilled the original way with a drill press, it took 10 minutes per base at a cost of $4.00 each. Using the automated router method, it took 1.9 minutes at a cost of $0.76

for each base. This is a cost reduction of 81% or $3.24 per base.

O & M Graphics. (new product) Technical Research worked with Educational Research to develop raised line (puff-ink) graphics for this kit. Technical Research designed computer drawings of generic street and room layouts to teach orientation and mobility. Silkscreens were made and prototypes were made from the silkscreens to show and seek production approval from members of the 1996 Educational Research and Development Committee. Documentation was completed and turned over to production. The first production run was completed and placed in stock.

O & M Graphics for Nomad. (new product) Educational Research staff programmed each individual graphic; Technical Research staff then took the graphic files and made master files for duplication. This is essentially the same product as the O & M Graphics except that the graphics could be used with the Nomad. Production documentation was completed and turned over to production. The first production run was completed and placed in stock.

On the Way to Literacy: Early Experiences for Visually Impaired Children. (redesign) Personnel from the Large Type Department and Technical Research looked into several options for the book covers and decided to have Midland make embossed binders with plastic rings. Binder colors were selected to go with each title. After some of the books were in the field, however, APH received complaints about the plastic rings breaking. Technical Research was ask to lead a group to determine the cause and find a solution. Many tests were done on the binders trying various types of plastic rings. The manufacturer of the rings worked with Technical Research on finding an acceptable solution. They made changes in the design of the rings which seemed to help. Midland agreed to take the binders back and exchange the original rings with modified ones and share half the cost of this with APH. Personnel from APH's Large Type Department pulled all books from stock, removed the pages, drilled out the old rings, and sent the binders back to Midland. Replacement binders were received and personnel from Large Type replaced the pages in the binders. Technical Research continues to look at finding an alternate method that would improve the quality and durability of the binding.

On the Way to Literacy II. (redesigned) The rings in these binders were replaced the same as was done in the first set of books. To help Manufacturing, Technical Research placed orders to have the sewn pages made for the next production run of 2,000. These were received and placed into stock for use on the next production run.

Painted Products. (continuing) Kits are being continually monitored on the firmplan to see if they include any painted parts that could be purchased already painted and ready to use.

Patterns: Level C. (new product) This was the third level of Patterns that was turned over to Technical Research for production documentation. Part numbers were requested and bills of materials were established. Manufacturing revised the bills of materials and setup routings for each of the parts which would be sold individually. There are nine individual kits for Patterns: Level C. Product documentation was completed for each of the kits and turned over to the appropriate production areas.

Pocket Slate. (new product) Technical Research designed and fabricated two prototypes for evaluation. These were very well received by APH staff and people in the field. Work has started to locate a vendor to make both the injection mold and the parts. Preliminary documentation has been started.

PrivatePhones - Stereo Headphone. (new product) Technical Research located a new stereo headphone of better quality than the one APH currently stocks. Califone sent Technical Research several samples of their headphones for evaluation purposes. They were found to be of a superior quality and also had a volume control knob on the headphone itself. A new catalog number was requested and a purchase order was placed. Califone printed the APH logo and catalog number on the headphones.

ProWORDS/ProBRAILLE/ProTERM. (new product) This is a set of software programs turned over to Technical Research to prepare the documentation necessary to get the product into production. It consists of three programs on disks, a print manual, and a braille reference section packaged together in a binder similar to APH's other software programs. A new catalog number

and part numbers were requested and entered into the CA computer system. A bill of materials and routings for this product were requested and completed.

Relief Map for Desk Use--Redesign. (completed) Based on the 95% labor savings when producing Landforms, Technical Research redesigned the Relief Map in order to silkscreen it first and then thermoform it, rather than thermoform it first and then paint it by hand. Production documentation was prepared and turned over to Manufacturing for the next production run. Using the redesign, the first run was completed at a substantial labor savings. On the second run, however, the revisions were somehow overlooked until midway through the run. Technical Research was asked to confirm the changes and provided a copy of the current production documentation to Manufacturing so that all subsequent production runs would be done using the revised method.

Replacement Parts Orders. (turned over to manufacturing) Technical Research staff set up a spreadsheet listing all replacement parts requested and their part numbers. Materials available to fill Parts Orders were determined; these materials were then transferred to Technical Research in order to fill orders. Approximately 95% of all Parts Orders received were filled. Technical Research then set up procedures for filling future orders and for recommending lists of parts which should be stocked. These procedures were turned over to Manufacturing for them to resume filling the orders.

Report on Studies of American Literacy Braille Code. (completed) Technical Research worked with Educational Research in documenting this product and getting the report produced. Documentation was completed and turned over to production. The report was produced and distributed.

Revised Parts Lists. (turned over to manufacturing) Technical Research revised parts lists on existing kits as they came up for production. Parts lists on new products were developed according to the currently agreed upon procedures. Manufacturing developed a new department called the BOM (bills of materials) squad, which worked on existing parts lists and redesigned them to correspond with entries into the CA computer system. Technical Research initially designs new parts lists and turns them over to the BOM squad where they redesign them as needed.

SlateMate. (new product) Educational Research asked Technical Research to design a pouch to carry a slate and stylus. Technical Research worked on developing a prototype. Handmade samples were made and changes were suggested. This process continued several times until a sample was approved. Technical Research contacted several vendors to make production samples. The Shieldall Company made several sample pouches and sent them in for approval. As requested, small changes were made and an approved sample was received. The SlateMate was named, a new catalog number was requested and entered into the computer system, and a purchase order was opened. The SlateMates were received and placed in stock.

Speech Ex-pressor. (new product) This product was designed exclusively by Technical Research staff. The design process progressed at a steady pace and is nearing the final design phase. Prototypes have been built and shown for evaluation purposes. Minor changes were suggested and made. Vendor selection and product documentation have begun.

Stereo to Mono Adaptor Plug. (new product) Technical Research searched for an adaptor plug so that the new headphone would work with APH's older mono products as well as with the newer stereo products. After many unsuccessful attempts, Califone was contacted. They agreed to make an adaptor plug for APH. A new catalog number was requested and entered into the computer system. A purchase order was opened for the adaptor plugs.

Swing Cell Compact. (completed) This is a redesign of an existing product which evolved into a new product. Technical Research worked with APH's Model Maker on product specifications and assembly procedures. Part numbers and a bill of material were entered into the computer system. Materials were ordered and received and transferred to Manufacturing along with product documentation. Technical Research was available for the first production run.

Table Top Cassette Recorder/Player. (new product) Technical Research looked for a vendor to make a new table top cassette recorder/player since Thomson Consumer was not interested in making any improvements to the current G.E. player. Technical Research looked into having parts of a new player designed. A contract was signed with a vendor to design and produce two working prototypes for evaluation and redesign as required. Once the prototypes are approved, the actual

manufacturing of the unit will be put up for bid to three or four vendors. The first prototypes are due in to APH this winter. Thomson Consumer agreed to make another run of 5,000 of the current General Electric players which APH is scheduled to receive in the fall.

Agencies Participating in Research

In addition to the agencies named here, appreciation is also extended to the many other agencies which cooperated with APH's research efforts by permitting members of their staffs to serve as consultants or respondents to requests for information.

Arkansas School for the Blind; Little Rock, Arkansas
Auburn University; Auburn, Alabama
Blue Bonnet Coop; Weatherford, Texas
Brooks Elementary; Shepherdsville; Kentucky
California School for the Blind; Fremont, California
Carr School; Lincoln Park, Missouri
Catholic Charities; Bangor, Maine,
Chandler Tripp School; San Jose, California
Chicago Lighthouse for People Who Are Blind or Visually Impaired; Chicago, Illinois
Children's Center for the Visually Impaired; Kansas City, Missouri
Children's Hospital Eye Clinic; Columbus, Ohio
Columbia Region 6; Portland, Oregon
Dallas Services for the Visually Impaired Children; Dallas, Texas
Digital Equipment Corporation; Maynard, Massachusetts
Dorchester Public School; Dorchester, Nebraska
ENTECH; Louisville, Kentucky
Fairfax County Public Schools; Fairfax, Virginia
Family Focused Early Intervention System; Harrisburg, Pennsylvania
Ft. Smith Public School; Hodgen, Oklahoma
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Microtalk; Texarkana, Texas
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New Standard Software; Columbus, Ohio
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North Dakota School for the Blind; Grand Forks, North Dakota
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Perkins School for the Blind; Watertown, Massachusetts
Pinellas County Schools; St. Petersburg, Florida
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Consultants

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Publications

Elder, V. W. (1996, February). The disabled can be enabled: Pursuing careers in engineering related areas. Micro Materials Update. Louisville, KY: American Printing House for the Blind.

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Hedges, J. K. (1996, May). APH gets on the internet. Micro Materials Update. Louisville, KY: American Printing House for the Blind.

Presentations and Workshops

Elder, V. W. (1995, October). NOMAD for Macintosh package. Training for Annual Meeting 1995, Louisville, Kentucky.

Elder, V. W. (1995, October). Technology exhibit. Exhibit for Annual Meeting 1995, Louisville, Kentucky.

Elder, V. W. (1996, May). Inventors and inventions that have aided the blind. Four presentations to groups of kindergarten-third grade, Crestwood Elementary, Oldham County, Kentucky.

Elder, V. W. (1996, July). Opening windows: An audio based tactile tutorial. Association for the Education and Rehabilitation of the Blind and Visually Impaired, International Conference, St. Louis, Missouri.

Gordon, M., & Pester, E. (1995, December). Reading, writing and the role of technology: The past, present, and future. Presentation at Getting in Touch with Literacy Conference, Austin, Texas.

Gordon, M., & Pester, E. (1996, July). The braille connection: Skills to last a lifetime. Presentation at Association for the Education and Rehabilitation of the Blind and Visually Impaired, International Conference, St. Louis, Missouri.

Hedges, J. K. (1995, October). Companion 2000. Workshop for the annual meeting. Louisville, Kentucky.

Hedges, J. K. (1996, May). Windows 95 for persons with low incident disabilities. Information technology: Kaleidoscope II, for the Ohio Resource Center for Low Incidence and Severely Handicapped, Columbus, Ohio.

Hedges, J. K., & Willis, D. H. (1996, April). Results of a national technology-related field survey. Poster session at the Council for Exceptional Children Conference, Orlando, Florida.

Johnson, D. J. (1996, July). Career counseling with teens and adults. Association for the Education and Rehabilitation of the Blind and Visually Impaired, International Conference, St. Louis, Missouri.

Otto, F. L. (1995, October). Tactile graphics teaching aids. Presentation for APH Annual Meeting attendees, Louisville, Kentucky.

Otto, F. L. (1996, July). Tactile graphics and the development of APH standards. Association for the Education and Rehabilitation of the Blind and Visually Impaired, International Conference, St. Louis, Missouri.

Otto, F. L. (1996, August). How does my attitude affect your self-esteem? In-service panel for Residential Staff, Kentucky School for the Blind, Louisville, Kentucky.

Pester, E. (1946, July). Methods and materials for introducing and teaching braille communication skills. A one-day summer workshop at the Institute for Visually Impaired Teachers at the University of New Orleans, New Orleans, Louisiana.

Pester, E., & Gordon, M. (1995, December). Literary braille for adults lat work and play. Presentation at Getting in Touch with Literacy Conference, Austin, Texas.

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Willis, D. H. (1996, July). Results of a national technology-related field survey. Poster session at the Association for Education and rehabilitation of the Blind and Visually Impaired International Conference, St. Louis, Missouri.

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Willis, D., Stiteley, J., & Hedges, J. (1995, October). Reading electronic books on a Companion2000. Closing the Gap Conference, Minneapolis, Minnesota.

Wright, S. (1995, December). Sharing books with young children with vision loss. Getting in Touch with Literacy, Austin, Texas.

New Products

Braillewriting Dot by Dot
- Big Cell
- Braille edition
- Print edition

Handi-Cassette II
- Carrying Case

Making Picture Recipes

Microcomputer Access Technology Training Module: ZoomText and ZoomText+

Move-Touch-Do

Nomad Touchblaster Software 6.0

O & M Tactile Graphics
- stand alone
- Nomad

Patterns: Spelling and English Program--Level C
- Braille edition
- Print edition

Plug--Stereo-to-Mono Adapter

Slatemate

Swing Cell Compact